

A Responsible Role For Science in Alleviating Environmental Problems¹

Stanley M. Greenfield

*Assistant Administrator for Research and Monitoring,
Environmental Protection Agency, Washington, D.C. 20460*

ABSTRACT

The Environmental Protection Agency (EPA) was created on December 2, 1970 as a new Federal organization to make possible an integrated attack on pollution. Its primary functions will be the consolidation and evaluation of data and setting of standards. The EPA will consider all sources of environmental pollution and will evaluate and act in areas such as recycling of waste products, the biological effects of pollutants, and the effects of technical and sociological change.

It is a great pleasure to be here with you this evening, especially to participate in honoring noteworthy accomplishments by some of our young scientists. The world has never stood in greater need of science and of talented young people to dedicate themselves to scientific investigation. Yet, incredibly, it seems that among many young people in this most scientific of all the Scientific Ages of Man, science has a rather hard time competing with tarot cards and the zodiac as a source of enlightenment. Even among those who are not so young, there are signs of a growing disenchantment with science — a visible suspicion of, and even revulsion from, the scientist and his efforts.

A generation ago, George Bernard Shaw, who viewed quite a few human endeavors with a jaundiced eye, flatly asserted that "Science is always wrong. It never solves one

problem without creating ten more." At the time, I suppose, most of us could have shrugged off Shaw's opinion as just the bad-tempered witticism of one who deliberately cast himself in the role of the iconoclast. Unfortunately, today, Shaw's unkind disapproval of the scientist and many of his works is shared, I am afraid, by a number of thoughtful, and a great many not-so-thoughtful, people.

The truth is that 20th century man — and the 20th century American, in particular, in spite of the very real benefits science and technology have brought him — is confronted with seemingly overwhelming societal advances. Growing pollution, with the threat of irreversible damage to the biosphere; noise; crowding; alienation from nature; the growing impersonality of a computerized world; "rural blight," "urban decay," "suburban sprawl" — these are just a few of the facets of modern life which, combined with the grim reality of the nuclear bomb, create

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a sense of frustration and helplessness among the beneficiaries of "progress." People are asking themselves if man is any longer in charge of his own destiny. Or, if instead, the forces of technology which he has unleashed are out of control and carrying him, full steam ahead, into a future — or non-future — which was never on the human agenda.

Indeed, the problems which have been associated with technological change have generated a wholesome spirit of self-examination in the scientific community itself. Rene Dubos, of course, has contributed important insights into the shortcomings of science as it relates to human needs and human problems. And Professor Robert Morrison of Cornell University, in a paper presented at a recent AAAS Conference on Science and the Future, conceded that the anti-science argument "depends on a careful demonstration that science raises new problems of increasing complexity as it continues to solve the older and simpler ones." So you see, while we may reject Shaw's harsh indictment that science is always wrong, we cannot deny that his view of the problem was at least partly right. I don't believe we can any longer, as scientists or as human beings, view with detachment the effects of our work on human life and human aspirations, nor can we ignore the gap between the promise and the reality of scientific advance.

We are in a difficult dilemma, torn between the traditional — and indeed valid — view that the search for scientific truth is its own justification, and the clear need to reexamine the goals of scientific technology in terms of what is socially and biologically desirable in terms of human progress. We must conclude, I think, with Dr. Dubos, that while we may not be responsible for the use society makes of our scientific achievements, "... we are guilty of escapism and irresponsibility if we do not concern ourselves with the social consequences of our work."

I want to speak to you about recent developments at the Federal level of government which are designed to alleviate the environmental problems which already af-

flict our changed and changing world, and enable our nation to make more rational and orderly environmental choices for the future. I want to tell you something of our plans in the new Environmental Protection Agency [EPA] for a new, more meaningful scientific approach to these problems. And I hope, thereby, to shed some small light on the way in which the environmental crisis bears on the overall responsibilities of the scientific community.

The EPA came into being on December 2, 1970 as a major part of a restructured Federal plan to implement the national policy (as defined by the National Environmental Policy Act) of encouraging "productive and enjoyable harmony between man and his environment."

EPA brings under one organizational roof the Federal programs dealing with air and water pollution, drinking water quality, solid wastes, pesticides, and environmental radiation. In addition, recent legislation has given our agency specific responsibilities with respect to the noise problem. In general, we are responsible for establishing and enforcing standards, monitoring pollution in the environment, conducting research and demonstrations, and assisting State and local governments in their pollution-control efforts.

EPA was established to make possible an integrated, coordinated attack on pollution, based on a view of the environment as it truly is — a single system of interdependent and interrelated parts. It is to fill the need, moreover, in the President's words, for "a strong independent agency" to serve as an objective, impartial arbiter of environmental matters, particularly in the standards-setting function.

Our agency is working closely with the other two new environmental agencies: the Council on Environmental Quality, which advises the President and coordinates Federal policy and action in the environmental field; and the National Oceanic and Atmospheric Administration in the Department of Commerce, which is responsible for research on long-range effects of pollution on the physical environment, especially global trends affecting the oceans and the atmos-

phere; and with all other Federal agencies on matters affecting the environment.

I believe that this new organizational structure places our nation in a much better position to make orderly and effective progress toward understanding and controlling environmental hazards. We in EPA believe we have a dual responsibility — we must be able to act quickly in those environmental matters that are urgent, and at the same time, we must be able to foresee and forestall what is coming. It is our task, in other words, to roll back the tide of pollution that is the legacy of past apathy and ignorance, and at the same time help to initiate an orderly system of making choices for the future that do not repeat or compound the mistakes of the past.

We have been given a number of new authorities to accomplish this. Let me mention, as one important example, the new provisions of the Clean Air Act, which were signed into law by the President on December 31, 1970. I cite this legislation in particular because I think it provides, within a specific context, a concrete illustration of two important developments in our society:

- There is emerging a genuine determination on the part of our people to make *societal* choices about the kind of life they live and the kind of world they live it in.

- The scientific community is being called upon to assume a direct responsibility for providing guidance in those societal choices — choices which will determine the habitability of the planet and the quality of human life.

The 1970 amendments of the Clean Air Act authorize for the first time the promulgation of national ambient air quality standards. Two types are now required: Primary standards to protect the public health, and secondary standards to protect the public welfare. Proposed standards on particulates, sulfur oxides, oxidants, hydrocarbons, carbon monoxide, and nitrogen oxides have been published. In accordance with the prescribed procedures, these should be promulgated about the end of April.

In addition, EPA is now required to establish performance standards which will limit emissions from new or modified

stationary sources of air pollution. Moreover, in the case of any air pollutant which we determine constitutes a serious hazard to health, emission standards providing an ample margin of safety are to be promulgated. Regulation of motor vehicle fuels and fuel additives is another new authority.

Society is telling us, it seems to me, that societal choices in these matters can be made in the polling booth, or the halls of Congress, in the marketplace, or perhaps even in the streets, but they cannot be made sensibly — the right choices cannot be assured — without sound, scientific guidelines that take into account the totality of human needs, biological, social, economic. And that science must, therefore, refocus its efforts to insure that sufficient attention is placed on solving these human problems.

Let me give you one other example of this new direction. This is the proposed Toxic Substances Act, one of many important new legislative proposals which the Administration has sent to the Congress to strengthen environmental programs. This legislation, if enacted, would authorize EPA to restrict or prohibit the use or distribution of a chemical substance if necessary to protect health and the environment. We would also be authorized to prescribe standards for tests, and the test results which must be met before a manufacturer can market a new product. The Act would establish, as a national policy, that new chemical substances should be adequately tested, and it stipulates as well that effective regulation of chemicals in interstate commerce necessitates the regulation of transactions in interstate commerce. This reflects, it seems to me, the growing and justifiable uneasiness of our whole society about our present deficiencies in dealing with chemicals in the environment, and a genuine national commitment to a new policy of thinking before we act.

As you can see, effective action under both existing and proposed authorities will require that EPA have sound data on what actually is being introduced into the environment, its impact on ecological stability, on human health, and on other factors important to human life.

We must be concerned, for example, with the effects of pollution on the flora and fauna and the natural beauty of our wonderful land, for who would deny their value to human welfare? Since pollutants are, in large part, valuable resources out of place, we must give attention to ways of limiting, recycling, or reusing the discards and effluents of our wasteful system of production and consumption. We must be concerned with the development of technology to control pollutants. And we must help to develop a system of technology assessment or forecasting, so that we can foresee and forestall emerging problems.

To be sure that we are setting standards that fully protect our own and future generations, we need to know more, far more, about what we are doing to ourselves and our planet. Of course, we cannot wait to set and enforce standards until we know everything there is to know, for science is never immutable, and the unhappy results of our past willingness to delay and postpone are all too evident. As we seek more and better data, we must act on the knowledge we now have or accept responsibility for future environmental decay and even tragic damage to the lives and health of our own or future generations.

Believe me, I am well aware of the difficulties of achieving the integrated, multi-disciplinary, holistic approach which the problems of human ecology, by their very nature, require. We are trying to unify and integrate a variety of research programs which have been primarily categorical, to counteract the natural human and scientific tendency to over-specialization, to create a cross-fertilization of ideas — a synthesis of knowledge from the biological, physical, and social sciences which can be interpreted in terms of total human and environmental needs.

We are determined to expand and improve our environmental monitoring. For example, a new inventory of industrial wastes by major water users is being initiated, with the cooperation of industry. We have in partial operation an integrated State-Federal-industry system for monitoring environmental radiation contamination

sources designed to meet the need for a new order of surveillance capability as the nuclear power industry expands. These things are essential for determining what is actually going into our environment and establishing base-lines of environmental quality.

In the biological sciences, we hope to improve our understanding of long-term exposures to environmental contaminants, of sub-acute or delayed effects on human and other organisms, of the combined and synergistic actions of chemical, biological, and physical stresses.

We must try to hasten progress in applied research relating to the control of pollutants, the recycling of so-called "wastes," and the development of sophisticated, non-polluting production processes.

Moreover, we must be able to assess the trends of technical and social change and evaluate not only their primary but potential secondary and tertiary impacts. The development of new systems of mass transit, for example, will alleviate certain important problems growing out of our current love-affair with the automobile. It will, at the same time, create new patterns of land use, possibly new sources of pollution, alterations in urban or rural life-styles. We must try to assess all of these factors as an interrelated whole, in so far as possible, as well as such matters as changing population growth rates, power needs, and alternative power sources.

We must be able to evaluate the social and economic effects of specific environmental controls, as well as the consequences of non-intervention. Such questions must be investigated simultaneously, with feedback and interchange of information among all branches of the inquiry.

EPA will be conducting and supporting research in all these matters. But we are well aware that our own science base can provide only a small part of the data which will be required to cope with pollution problems or to furnish other needed guidelines for achieving sane use of the global environment and the desired stability and harmony of the ecosystem.

To a large extent, ours will be the role of consolidating and evaluating information as it is developed throughout the scientific community. We will be drawing on the expertise and findings of other governmental scientific bodies — NOAA, the National Institute for Environmental Health Sciences, NASA, as example's — and many others. But the success of our mission and the success of the Nation in stopping the drift toward environmental chaos will depend upon the contributions of scientists everywhere toward the development of a sound scientific base for environmental action. And this depends upon many things: On concerning ourselves with the social consequences of our work, as Dr. Dubos has pointed out; on viewing our work in terms of a large whole; on establishing communication and working relationships across disciplinary lines.

There is, as we all know, a growing movement on the part of scientists to meet this challenge. Ecological centers and institutes are being established. Universities are revising their science curricula to broaden the individual student's area of interest and training. Attention is being given to the need for new institutional arrangements capable of addressing the multifaceted character of the total environmental problem. My own discipline of atmospheric science, for example, would appear to be a key component

of such institutional solutions, but only in combination with other disciplines that are largely foreign to most current concepts of research colleagues. Scientists are speaking out, not only about the misapplication of scientific advance, but about science priorities, even questioning the overall desirability of some avenues of investigation. I believe all of us in science must welcome such signs of a new scientific maturity and do everything we can as scientists and as human beings to encourage and advance the trend.

The stakes are high, for the uncontrolled rush of technology propels us ever closer to the brink of environmental insanity. We can stand aside and speculate where these forces are taking us, or we can specify the future we desire and examine ways of getting there from the present. Of course, neither man nor his science is omniscient; he cannot hope to manage his environment flawlessly. But he can make choices, based on rational thinking and verifiable facts — the stuff of science.

If we can provide this thinking and these facts, we may help to usher in a new age of scientific enlightenment, an age when our study of the microcosm becomes truly relevant to our understanding of the macrocosm, an age when man can justify his long-held faith that science is the key to the elevation and advancement of the human species.